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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT

PAPER NUMBER

1774

DATE MAILED: 05/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/995,814	DOI ET AL.	
	Examiner	Art Unit	
	Marie R. Yamnitzky	1774	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02/13/04.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. This Office action is in response to applicant's amendment received February 13, 2004, which amends claims 1-3, 5, 8, 9 and 13, and adds claims 18-27.

Claims 1-27 are pending.

The examiner notes that the correct status identifier for claim 3 in applicant's amendment received February 13, 2004 is "(currently amended)".

Although claim 6 is identified in the amendment as an original claim, the examiner notes that "represented formulae" in line 2 originally read --represented by formulae--.

2. The objection to claims 11-17 under 37 CFR 1.75(c), as set forth in the Office action mailed August 13, 2003, is overcome by applicant's amendment.

The rejection of claim 13 under 35 U.S.C. 112, 1st paragraph, as set forth in the August 13th action is overcome by applicant's amendment, but a similar issue is raised in this Office action with respect to new claim 23.

The rejection of claims 5 and 13 under 35 U.S.C. 2nd paragraph as set forth in the August 13th action is overcome by applicant's amendment. New issues raised by applicant's amendment are set forth in this action.

The miscellaneous issues noted in the August 13th action are corrected by applicant's amendment.

3. Claim 23 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim contains subject matter which was not described in the

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specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification does not enable one skilled in the art to make and use a light emitting device in which a layer comprising an electron transporting compound is disposed between the anode and the light emitting layer, and a layer comprising a hole transporting compound is disposed between the cathode and the light emitting layer.

This rejection could be overcome by changing "anode" to --cathode-- in line 3 of claim 23, and changing "cathode" to --anode-- in line 4 of claim 23.

4. Claims 3 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation of "aryl group" in the definition of R_1' and R_2' in claims 3 and 5 is inconsistent with the amendment made to claims 1 and 2 replacing "aryl group" with "alkylphenyl group, alkoxyphenyl group".

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 1, 2, 4 and 6-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al. (US 6,169,163 B1).

Woo et al. disclose a fluorescent polymer similar to the polymer defined in present claims 1, 2, 4, 6 and 7 comprising a repeating unit similar to the repeating unit of formula (1) and comprising a repeating unit of formula (8), wherein Ar₁ is represented by formula (6) wherein X₉ is -N=CR₂₄- and X₁₀ is -N= and Ar₁ is substituted by two aryl groups. See Woo's polymer P-11 as defined in Table 4 (c. 49-50) with reference to Table 2 (c. 43-44) for the structure of monomer M-17 and Table 3 (c. 47) for the structure of monomer M-30. Monomer M-17 provides a repeating unit similar to the repeating unit of present formula (1) and monomer M-30 provides a repeating unit of present formula (8). Ar₂ of the repeating unit of formula (8) is represented by formula (2') as defined in present claim 4. The amount of repeating units in polymer P-11 meets the limitations of present claims 6 and 7.

Monomer M-17 differs from present formula (1), and P-11 therefore differs from the present polymeric fluorescent substance, in that the substituents on Ar₁ are unsubstituted phenyl groups whereas the present claims limit phenyl groups to alkylphenyl and alkoxyphenyl groups.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make other fluorene-based polymers within the scope of Woo's polymers containing conjugated groups other than those specifically disclosed by Woo et al. in Table 2. One of ordinary skill in the art would have been motivated to make fluorene-based polymers other than those specifically disclosed by Woo et al. in order to make a variety of fluorene-based polymers suitable for use in a light-emitting device. Woo et al. teach that the conjugated groups

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copolymerized with fluorene may be substituted (c. 12, l. 45-53). In view of Woo's teachings, one of ordinary skill in the art would have reasonably expected that monomeric units similar to M-17, having alkylphenyl or alkoxyphenyl groups in place of phenyl groups, would be suitable for Woo's purposes.

Woo et al. disclose electroluminescent devices wherein the fluorescent polymer is disposed between an anode and a cathode. For example, see c. 19, l. 42-c. 22, l. 44 and Device No. D-18 (c. 49, l. 60-c. 51, l. 43). Additional layers as required by present claims 9-13 and 19-23 are suggested by the prior art (presuming, in the case of claim 23, that the layer comprising an electron transporting compound should actually be disposed between the cathode and the light emitting layer, and the layer comprising a hole transporting compound should actually be disposed between the anode and the light emitting layer).

Woo et al. do not specifically disclose that polymer P-11 has a number-average molecular weight within the range set forth in present claim 1, but it would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum number-average molecular weights for Woo's fluorescent polymers based on properties affected by molecular weight. One of ordinary skill in the art would have been guided to number-average molecular weights within the presently claimed range based on Woo's teachings regarding preferred weight average molecular weights and preferred polydispersity (ratio of weight average molecular weight to number average molecular weight) as set forth at c. 9, l. 65-c. 10, l. 26. Woo et al. teach a preference for a number-average molecular weight that is close to

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the weight average molecular weight in order to improve film quality of a film formed from the polymer (e.g. see c. 1, l. 54-59).

Further with respect to present claims 14-17 and 24-27, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to utilize Woo's polymeric electroluminescent devices in articles which conventionally make use of electroluminescent devices.

7. Claims 1-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shi et al. (US 6,361,887 B1).

Shi et al. disclose fluorescent polymers comprising one or more repeating units of formula (1) and one or more repeating units of formula (8) as defined in present claim 1, wherein Ar_1 is represented by formula (4) as defined in claim 1 wherein X_5 is $-CR_{21}=CR_{22}-$ and X_6 is $-CR_{30}=$, and further represented by formula (1') as defined in claim 3. Shi et al. disclose electroluminescent devices wherein the fluorescent polymer is disposed between an anode and a cathode. For example, see the abstract, column 37, line 57-c. 38, l. 55 and the claims.

Among polymers 1-198 having the formulae shown in columns 5-38 of Shi's patent are numerous polymers comprising a repeating unit of formula (1) wherein Ar_1 is represented by formula (4) wherein X_5 is $-CR_{21}=CR_{22}-$ and R_{21} or R_{22} is an alkyl or alkoxy group. For example, the first naphthalene ring structure of polymer 2 is a divalent group represented by present formula (4) wherein R_{21} is an alkoxy group and the second naphthalene ring structure of polymer 2 is a divalent group represented by formula (4) wherein R_{22} is an alkoxy group.

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Polymer 71 having the formula shown in columns 15-16 of Shi's patent comprises a repeating unit of formula (8) wherein Ar_2 is represented by formula (2') as defined in present claim 4.

Regarding present claim 2, aryl and heteroaryl groups are among the possible substituents for the divalent group represented by Ar_1 (the naphthalene ring structures of the formula set forth in Shi's abstract) as taught by Shi et al. The aryl groups may be substituted, and Shi et al. specifically disclose "tolyl" (see c. 3, l. 36), which is an alkylphenyl group.

Regarding present claims 6 and 7, the prior art discloses various polymers meeting the limitations of these claims. For example, in the aforementioned polymer 71, the total number of repeating units represented by formulae (1) and (8) is 100 mol% of all repeating units, and the amount of repeating units represented by formula (1) is 50 mol% based on the total amount of repeating units represented by formulae (1) and (8).

Devices having the layer structure specified in claim 8, with claims 11-13 dependent therefrom, and in claim 18, with claims 21-23 dependent therefrom, are disclosed by Shi et al. (e.g. see c. 37, l. 57- c. 38, l. 55), presuming the positions of the electron transporting compound and the hole transporting compound should be reversed for claim 23.

The only limitation of present claims 1-8, 11-13, 18 and 21-23 that is not explicitly disclosed by Shi et al. is the polystyrene reduced number-average molecular weight. Shi et al. disclose weight average molecular weights. For example see c. 37, l. 27-31 and Table 1 in c. 54. It would have been within the level of ordinary skill of a worker in the art at the time of the

invention to determine suitable and optimum number average molecular weights for Shi's fluorescent polymers based on properties affected by molecular weight.

Further with respect to present claims 9, 10, 19 and 20, it would have been within the level of ordinary skill in the art at the time of the invention to include auxiliary layers based on the properties afforded by those layers. The layers required by claims 9, 10, 19 and 20 are suggested by Shi et al. (e.g. see c. 38, l. 32-43).

Further with respect to present claims 14-17 and 24-27, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to utilize Shi's polymeric electroluminescent devices in articles which conventionally make use of electroluminescent devices.

8. Claims 1-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi et al. (EP 1 043 382 A2).

See the whole document, especially the claims and paragraphs [0017]-[0021], [0034] and [0042].

Noguchi et al. suggest polymeric fluorescent substances within the scope of the present claims.

The fourth and seventh formulae following "[Chemical formulae 9]" in paragraph [0019] represent divalent groups represented by present formulae (6) and (7), respectively. The first, second, fifth and sixth formulae following "[Chemical formulae 10]" represent divalent groups

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represented by present formulae (5), (2), (4) and (3), respectively. The fifth and sixth formulae following “[Chemical formulae 13]” represent divalent groups represented by present formulae (3) and (4), respectively.

The second, third, fifth, sixth, eighth, ninth and tenth formulae following “[Chemical formulae 15]”, the first, third, seventh, eighth and tenth formulae following “[Chemical formulae 16]”, and the sixth-fifteenth formulae following “[Chemical formulae 21]” also represent divalent groups within the scope of Ar_1 as defined in present claim 1.

The fifth formula following “[Chemical formulae 10]” further represents a divalent group represented by formula (1') as defined in present claim 3. The seventh formula following “[Chemical formulae 13]” represents a divalent group represented by formula (2') as defined in present claim 4.

Noguchi et al. suggest the use of these polymeric fluorescent substances in polymer light emitting devices having the layer structures required by present claims 8-13 and 18-23 (presuming, in the case of claim 23, that the positions of the electron transporting compound and the hole transporting compound should be reversed). Noguchi et al. further suggest the use of polymer light emitting devices comprising these polymeric fluorescent substances in articles as claimed in present claims 14-17 and 24-27.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make various polymeric fluorescent substances suggested by Noguchi et al. and to utilize the polymeric fluorescent substances for the suggested purposes.

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9. Applicant's arguments filed February 13, 2004 have been fully considered but they are not persuasive.

Regarding the Woo patent, Woo et al. specifically teach that the conjugated groups that are copolymerized with the fluorene may be substituted with a variety of substituents. While applicant argues that the present invention provides strong fluorescence that would not have been expected from the teachings of Woo, there is no evidence of record demonstrating that a polymer according to the present claims having alkylphenyl or alkoxyphenyl groups in place of the unsubstituted phenyl groups of Woo's monomer M-17 in Woo's polymer P-11 has superior/unexpected properties compared to Woo's polymer P-11.

Regarding the Shi patent, applicant argues that Shi et al. do not specifically teach a polymer having repeating units of formula (1) and formula (8). The examiner respectfully disagrees. From a review of the Shi patent, it appears to the examiner that each of Shi's polymers 1 through 198 actually has at least one repeating unit of formula (1) and at least one repeating unit of formula (8).

Formula (1) as defined in present claim 1 encompasses a divalent naphthalene group bonded into the main chain of the polymer at positions 2 and 6 of the naphthalene ring structure. Each of Shi's polymers 1-198 has such a group. Note that the presently claimed polymer can have more than one repeating unit of formula (1). Accordingly, each of the two divalent naphthalene groups in Shi's specific polymers, having different substitution patterns relative to each other, meets the limitations of Ar₁ of formula (1) and of formula (1') in present claim 3.

Formula (8) as defined in present claim 1 encompasses any arylene group or divalent heterocyclic compound group that is not represented by any of formulae (2) to (7), and that has 0 or 1 substituted or unsubstituted vinylene group. None of formulae (2) to (7) represents a divalent anthracene group bonded into the main chain of the polymer at positions 9 and 10 of the anthracene ring structure. Therefore, the divalent anthracene group in each of Shi's polymers meets the limitations of the repeating unit of formula (8) wherein n is 0. Various of Shi's polymers also comprise other divalent aromatic groups that meet the limitations of Ar_2 for formula (8) and thus meet the limitations of a repeating unit of formula (8). Note that the presently claimed polymer can have more than one repeating unit of formula (8).

None of formulae (2) to (7) represent a divalent fluorene group. In Shi's polymer 71, the fluorenylene group meets the limitations of Ar_2 of formula (8) and of formula (2') in present claim 4. Shi's polymer 71 meets the limitations of polymer as defined in present claims 1 and 4 wherein n of formula (8) is 0 or 1.

Additional repeating units in some of Shi's polymers that are not within the scope of repeating units of present formula (1) or present formula (8) are not excluded by the present claim language. None of the present claims require the polymer to consist of repeating units of formulae (1) and (8). The present claim language is quite broad and covers numerous polymers which may include repeating units not explicitly defined in the claims, such as repeating units taught on pages 34-35 of the present specification.

With respect to the Noguchi reference, applicant argues that Noguchi et al. do not specifically teach a polymer having repeating units of formulae (1) and (8). The examiner agrees

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that Noguchi et al. do not disclose a specific example of a polymer meeting the present claim limitations; if they did, the rejection would be one of anticipation rather than obviousness. However, Noguchi et al. suggest numerous polymers within the scope of the present claims.

With respect to applicant's arguments regarding superior unexpected properties, applicant has pointed to no evidence of record in support of these arguments.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for Art Unit 1774 is (703) 872-9306 for all official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY
April 30, 2004



MARIE YAMNITZKY
PRIMARY EXAMINER

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